

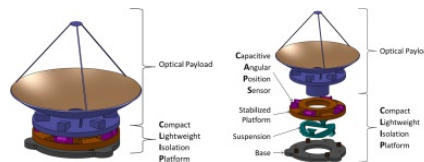
# Compact, Lightweight Isolation Platform (CLIP), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## ABSTRACT

NASA has a critical need for improved bi-directional data transmission rates from a variety of spacecraft to Earth. NASA estimates that the current Mars to Earth transfer rate of 6 Mbps might be increased to 600Mbps using a Laser Communication (LC) system. Beam jitter caused by spacecraft-based motion must be reduced to sub-microradian levels to enable beaconless optical beam pointing. ATA will create a Compact, Lightweight Isolation Platform (CLIP) that will host the LC collimator telescope and provide a stabilized platform to prevent the 150-microradian spacecraft disturbance environment from reaching the LC terminal. To enable that stabilization, ATA will develop an ultra-low angular noise Capacitive Angular Position Sensor (CAPS). The proposed sensor will have low power and high reliability, which ATA will demonstrate by producing TRL 4 prototypes in Phase I and TRL 5 CLIP engineering development unit (EDU) in Phase II. The integrated CLIP overall design is a major innovation. Most significantly, the platform payload capacity must increase from the typical few hundred grams to as much as 50 kilograms, roughly two orders of magnitude, but without major growth in the mass of the platform itself. While the payload for most stable platforms is only a small fraction of the platform overall mass, the CLIP payload must be from more than half (3 kg) to as much as 94 percent of the total platform mass (3-50 kg payload + 3 kg platform). Combined with the large payload range, the needed disturbance rejection from 150-microradian to less than 0.5-microradian across the broad frequency range of 0.1 to 500 Hz requires innovation in the platform suspension, high-performance actuators, servo controls, and structure. Other programs have demonstrated these requirements individually, but the innovation CLIP provides is to combine structure, suspension, actuators, and sensors to give the required performance within the stringent 3-kg weight and 15-W power constraints.

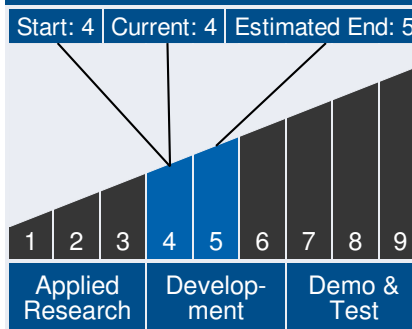


Compact, Lightweight Isolation Platform (CLIP)

## Table of Contents

Abstract . . . . .	1
Technology Maturity . . . . .	1
Management Team . . . . .	1
Anticipated Benefits . . . . .	2
Technology Areas . . . . .	2
U.S. Work Locations and Key Partners . . . . .	3
Details for Technology 1 . . . . .	4

## Technology Maturity



## Management Team

### Program Executives:

- Joseph Grant
- Laguduva Kubendran

### Program Manager:

- Carlos Torrez

*Continued on following page.*

# Compact, Lightweight Isolation Platform (CLIP), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## ANTICIPATED BENEFITS

### To NASA funded missions:

Potential NASA Commercial Applications: Beginning with a NASA funded Phase I SBIR, ATA developed the stable platform concept that serves as the basis for the laser communication terminal that NASA will be flying on the Lunar Laser Communications Demonstrator (LLCD). In September 2013, NASA GSFC awarded a contract to ATA for two (2) innovative inertially stable platforms for the Laser Communications Relay Demonstrator (LCRD) in support of the NASA Space Communications and Navigation (SCaN) Architecture Roadmap. Our proposed Compact Lightweight Stable Platform (CLIP) and Capacitive Angular Position Sensor (CAPS) could host the laser collimator for NASA's integrated Radio and Optical Communications (iROC) program, which seeks to implement beaconless laser communication from Mars by 2025. ATA's inertially stabilized platform technology also has applicability for the NASA Next Generation Tracking and Data Relay Satellite (TDRS).

### To the commercial space industry:

Potential Non-NASA Commercial Applications: ATA expects laser communications to continue to expand in DoD space programs and we will work directly with government agencies on technology development. We have established relationships with major aerospace prime contractors including Boeing and Lockheed Martin, and will be supplying stabilized platforms and inertial reference units to these customers. ATA is producing Inertially Stable Platform Assemblies (ISPAs) for a Government organization. Naval Air Weapons Center Weapons Division (NAWCWD) at China Lake, California is procuring a Tactical Inertial Reference Unit (TIRU) for their Helicopter Beam Director (HBD) program and a customer at the Air Force Research Laboratory (AFRL) has shown interest in procuring a TIRU-like device through a follow-on contract with High Energy Laser Joint Technology Office (HEL JTO). Boeing has partnered with ATA

## Management Team (cont.)

### Project Manager:

- Robert Romanofsky

### Principal Investigator:

- Nick Jacka

## Technology Areas

### Primary Technology Area:

Communications, Navigation, and Orbital Debris Tracking and Characterization Systems (TA 5)

- └ Optical Communications and Navigation (TA 5.1)
  - └ Acquisition and Tracking (TA 5.1.4)
    - └ Disturbance-Free Platform (TA 5.1.4.1)

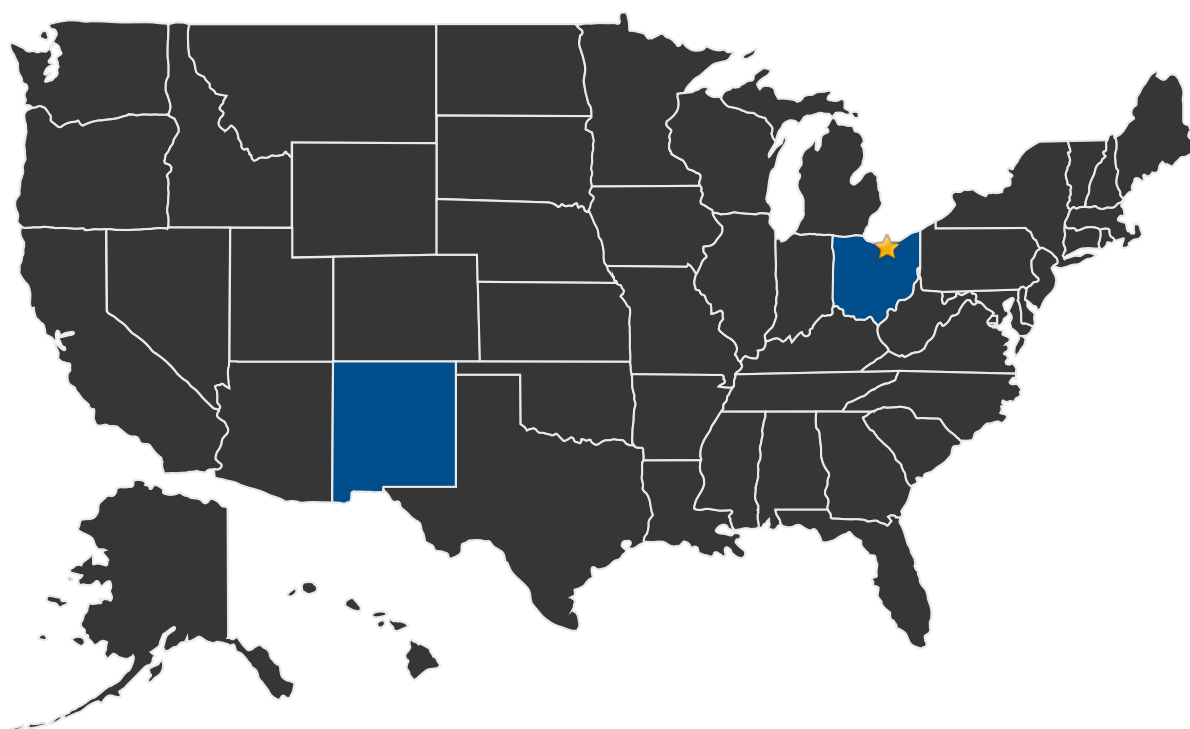
# Compact, Lightweight Isolation Platform (CLIP), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



on the Magnetohydrodynamic Inertial Reference Unit (MIRU-D) Phase II SBIR and ATA is working a follow-on effort to develop this device specifically to support the Missile Defense Agency (MDA) experiments being conducted on the Boeing Phantom Eye unmanned aircraft system (UAS). ATA anticipates selling additional vibration isolation devices for Line-of-Sight Stabilization (LOSS) to the NRO, SMC, and TESAT.

## U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States With Work      ★ **Lead Center:**  
Glenn Research Center

### Other Organizations Performing Work:

- Applied Technology Associates (Albuquerque, NM)

## PROJECT LIBRARY

# Compact, Lightweight Isolation Platform (CLIP), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## **Presentations**

- Briefing Chart
  - (<http://techport.nasa.gov:80/file/20213>)

## **DETAILS FOR TECHNOLOGY 1**

---

### **Technology Title**

Compact, Lightweight Isolation Platform (CLIP)